What is claimed is:

1. A cycloolefin copolymeric (COC) optical communication device, comprising:

a core section of functional metallocene cycloolefin copolymer (f-mCOC) having a refractive index n_1 for light transmission; and

a cladding layer of metallocene cycloolefin copolymer (mCOC), having a refractive index n_2 smaller than n_1, surrounding the core section, and forming a waveguide structure together with the core section.

2. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the functional metallocene cycloolefin copolymer is synthesized from ethylene, norbornene, and a third monomer having an active site catalyzed by a metallocene catalyst.

3. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 2, wherein the third monomer having an active site is 4-methyl-styrene, 5-ethyl-2-norbornene or 5-ethylidene-norbornene.

4. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the refractive index n_2 of the cladding layer is 1.5200-1.5400 while the refractive index n_1 of the core section is

1.5215-1.5631, depending on the requirement of a multi-mode device or a single-mode device.

5. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the metallocene cycloolefin copolymer is synthesized from ethylene and norbornene catalyzed by a metallocene catalyst.

6. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the cycloolefin copolymeric (COC) optical communication device is a multi-mode device, and the refractive-index difference between the core section and the cladding layer Δn ($=n_1-n_2$) is 0.8%-1.5%.

7. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the cycloolefin copolymeric (COC) optical communication device is a multi-mode device, and the refractive-index difference between the core section and the cladding layer Δn ($=n_1-n_2$) is 1.0%-1.2%.

8. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the cycloolefin copolymeric (COC) optical communication device is a single-mode device, and the refractive-index difference between the core section and the cladding layer Δn ($=n_1-n_2$) is 0.1%-0.84%.

9. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the

cycloolefin copolymeric (COC) optical communication device is a single-mode device, and the refractive-index difference between the core section and the cladding layer Δn ($=n_1-n_2$) is 0.3%-0.35%.

10. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the refractive indices n_1 and n_2 are adjusted by altering the respective components of the core section and the cladding layer.

11. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, further comprising a U-groove and a packaging mechanics.

12. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 11, wherein the U-groove is for passive alignment.

14. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 11, wherein the packaging mechanics is a micro lens or a micro lens array.

15. The cycloolefin copolymeric (COC) optical communication device as claimed in claim 1, wherein the transmission of the f-mCOC and mCOC to visible light is greater than 90%.